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Watershed-based landslide yield assessment as a new basis for model validation

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Shallow landslide modeling has been widely studied and developed in the last 15 years and methods to assess rainfall triggering both in space and time have steadily evolved towards something that is nowadays recognized as a sound theoretical framework. The distributed application of deterministic schemes plays a major role in this kind of modeling, building on a large series of research findings obtained for different areas in the world. Despite this strong theoretical basis and the effectiveness of some model implementations, though, very few cases of shallow landslide modeling applications offer convincing validation results when compared to field data. This is generally due to the fact that a validation based on landslide scar overlay comparisons between prediction and observation is very difficult to obtain mainly because of the high spatial variability of model parameters in space and time. Here, we try to compare, for the Armea valley (Italy), two different validation methods of a simple infinite-slope landslide modeling scheme to show that, if validation is carried out as a computation of intensity along channels instead of as simple polygon matching, results of modeling can be used more effectively in hazard and risk prediction. The Armea valley (Liguria, Italy) has been recently affected by a number of severe rainstorms that probably reached a maximum effect in two cases, when, in November 2000 and in December 2006, they triggered several shallow landslides generating casualties and damages to buildings, roads and land properties. In this work, a module for estimating soil saturation according to recorded precipitation, a soil depth prediction scheme and a limit-equilibrium infinite slope stability algorithm have been applied to the test area for those two extreme events producing maps of the factor of safety (FoS). The FoS prediction maps, based on real-time rainfall data, where compared to the post event landslide inventories for

the two major events cited above using two different techniques. The first comparison method was based on simple polygon overlay whilst the second relied on the difference between expected and observed mass (or sediment) yield at channel junctions for different level of Horton's ordering. This second approach has the advantage to be more robust and to offer a measure of model performances that is directly linked to intensity and risk prediction.